PATENT SPECIFICATION

1,150,295

DRAWINGS ATTACHED.

1,150,295

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COMPLETE SPECIFICATION.

Improvements in Tyres.

We, THE DUNLOP COMPANY LIMITED, (formerly Dunlop Rubber Company Limited), a British Company of Dunlop House, Ryder Street, St. James', London, S.W.1. (formerly of 1, Albany Street, London, N.W.1.), do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a vehicle tyre.

According to the invention there is provided a vehicle tyre having a tread portion comprising at least one generally circumferential rib and a generally circumferential groove on at least one side thereof, the rib having a plurality of slots formed therein which extend radialiy inwardly from the ground-contacting surface of the rib and generally transversely thereof, the opposed sidewalls of each slot being interengaged with one another in such manner that relative movement between said walls is substantially prevented in a direction radially of the tyre.

In one example of the above, each of said opposed sidewalls of each slot is provided with one or more projections extending therefrom towards the other sidewall, the or each projection of one of said side walls being in co-operative engagement with a corresponding projection on the other side wall. Each projection may extend the full length of the sidewall of the slot and be formed with at least one side face for engagement with a side face of a co-operating projection, said side face extending substantially normal to the mid-circumferential plane of the tyre. Alternatively said projections may comprise a plurality of diamond-shaped facets formed on one sidewall, the opposite sidewall being complementarily formed.

In an alternative construction the opposed sidewalls of each slot are bonded together at one or more positions to prevent said relative radial movement between said walls.

In any of the above constructions the radially-innermost extremities of some at least of the slots are of enlarged cross-sectional form considered in a plane lying transversely of the slots to define a channel, one for each slot, extending to the groove.

Embodiments of the invention will now be described in more detail with reference to the accompanying drawings wherein,

Figure 1 is an axial cross-sectional view in the shoulder region of a part of a tyre constructed in accordance with the invention.

Figure 2 is an end view of that part of the tyre shown in Figure 1.

Figure 3 is an axial cross-sectional view in the shoulder region of a part of a modified construction of a tyre, and

Figure 4 is an axial cross-sectional view in the shoulder region of a part of another modified construction of tyre.

Referring to Figures 1 and 2 of the drawings there is shown a vehicle tyre having a tread portion comprising a plurality of generally circumferential ribs 10 separated by generally circumferential grooves 11, the grooves being formed one at each side of the ribs except in the case of the axially-outermost ribs where a groove is formed only at the axially-inner side thereof. The axially-outer side of each of the axially-outermost ribs forms part of the outer sidewall region of the tyre in the shoulder region thereof.

A plurality of circumferentially-spaced-

apart slots 12 are moulded in each rib 10, each slot extending transversely across the full width of the rib, substantially normal to the mid-circumferential plane of the tyre. Thus the slots 12 in the axially-outermost ribs extend from the groove 11 to the sidewall of the tyre (as is clearly shown in Figure 1) whilst the slots formed in the remaining ribs extend between adjacent grooves to such ribs.

Each slot 12 is of parallel-sided rectangular form in transverse cross-section at and adjacent to the ground-contacting surface of the rib 10 but the remainder of each slot extending radially inwardly from said surface is of a sinuous transverse cross-sectional configuration. Such a configuration defines a plurality of co-operating projections 13 extending from one sidewall of the slot 12 towards the other sidewall. Each such projection 13 extends longitudinally of each slot 12 i.e. normal to the mid-circumferential plane of the tyre, and the curved side-face of each projection, which is of domed configuration considered in a generally circumferential plane of the tyre because of the sinuous configuration of the slot, extends substantially parallel to the corresponding curved side-face of a co-operating projection formed on the opposite sidewall of the slot.

At the radially-innermost extremity of each slot 12 there is formed an enlarged channel 14 of substantially circular transverse cross-sectional form which also extends across the full width of the rib 10 normal to the mid-circumferential plane of the tyre.

In each of the axially-outer ribs (as shown in Figure 1) the channel 14 is of a greatly enlarged cross-sectional area, considered in a plane lying transversely of the channel, as shown at 15, at and adjacent the axially-outer surface 16 of the rib 10, the open mouth of the channel in the axially-outer face of the rib being of substantially straight-sided form and extending from slightly radially inwardly of the base of the rib radially outwardly to a position adjacent the ground-contacting surface of the rib 10.

The slots which are formed in those ribs other than the axially-outermost ones are also formed with an enlarged channel 14 at their radially inner extremities but these channels are not formed with enlarged mouths where they terminate in the grooves 11. One such slot and channel is shown in dotted lines in Figures 1 and 2 of the drawing and all of these channels are tapered axially being divergent in the direction of the adjacent sidewall of the tyre.

In the modified construction shown in Figure 3 of the drawings the slots 12 and channels 14 are formed in each rib 10 substantially as described hereinbefore but relative radial movement between the opposed sidewalls of each slot is prevented by means of a plurality of projections comprising generally diamond-shaped facets 17 formed on one slot sidewall, the opposite sidewall being complementarily formed. The facets extend outwardly from said one slot sidewall towards, and interengage with, the complementary formation of facets on the other slot sidewall.

Those ends of the channels 14 in the axially-outer surface of the axially-outermost ribs are again formed with mouths 15 of greatly enlarged transverse cross-sectional area. In this construction the radially-innermost surface, or base, of the mouth 15 of the channel is formed with a radially outwardly extending projection 18 by means of which water or mud ejected from the channel is deflected radially outwardly of the tyre whereby such ejected fluids are not projected onto adjacent vehicles or pedestrians.

In Figure 4 of the drawings there is shown a further modified construction wherein the slots 12 and channels 14 are again formed in each rib 10 substantially as hereinbefore described. In this construction relative radial movement between the opposed sidewalls of each slot is again substantially prevented by the formation of projections 13 of domed configuration as is described above with reference to Figures 1 and 2.

Those ends of the channels 14 in the axially-outer surface of the axially-outermost ribs are again formed with mouths 15 of greatly enlarged transverse cross-sectional area. However in this construction there is also provided a shoulder safety rib 19 having a suitably shaped axially inner surface 20 whereby water or mud ejected from the channels is deflected by the surface 20 from a direction axially of the tyre to a substantially radially-outward direction. Such a surface 20 may be shaped so as to tend to deflect the ejected water or mud either circumferentially or radially of the tyre.

The provision of the slots in the ribs of the tread portion assists in removal of water film from wet road surfaces after the bulk removal of water by the generally circumferential grooves. Both the bulk removal and water film removal stages are assisted by the provision of the channels formed at the radially-innermost extremities of the slots. It will be appreciated that the slots need not extend truly transversely of each rib, that is at 90° to the mid-circumferential plane of the tyre. The slots, and associated channels, may for example be inclined at any suitable angle to such plane and the slots in any one rib may be arranged to be inclined in opposite directions to said plane.

However, in all the constructions herein-

before described, the interengagement between the opposed sidewalls of the slots ensures that substantially no relative movement takes place between such walls of each slot in a direction radially of the tyre. Thus excessive heat generation and wear between the opposed sidewalls of the slots is substantially reduced or eliminated.

WHAT WE CLAIM IS:—

1. A vehicle tyre having a tread portion comprising at least one generally circumferential rib and a generally circumferential groove on at least one side thereof, the rib having a plurality of slots formed therein which extend radially inwardly from the ground-contacting surface of the rib and generally transversely thereof, the opposed sidewalls of each slot being interengaged with one another in such manner that relative movement between said walls is substantially prevented in a direction radially of the tyre.

2. A vehicle tyre as claimed in claim 1 wherein each of said opposed sidewalls of each slot is provided with one or more projections extending therefrom towards the other sidewall, the or each projection on one of said sidewalls being in co-operative engagement with a corresponding projection on the other sidewall.

3. A vehicle tyre as claimed in claim 2 wherein each projection extends the full length of the sidewall of the slot and is formed with at least one side face for engagement with a side face of a co-operating projection.

4. A vehicle tyre as claimed in claim 3 wherein said side face extends substantially normal to the mid-circumferential plane of the tyre.

5. A vehicle tyre as claimed in claim 2 wherein said projections comprise a plurality of facets formed on one sidewall, the opposite sidewall being complementarily formed.

6. A vehicle tyre as claimed in claim 1 wherein the opposed sidewalls of each slot are bonded together at one or more positions to prevent said relative radial movement between said walls.

7. A vehicle tyre as claimed in any one of the preceding claims wherein each slot extends across the full width of the rib.

8. A vehicle tyre as claimed in any one of the preceding claims wherein the radially-innermost extremities of some at least of the slots are of enlarged transverse cross-sectional form considered in a plane lying transversely of the slots to define a channel, one for each slot, extending into the groove.

9. A vehicle tyre as claimed in claim 8 wherein a plurality of ribs and associated grooves are formed in the tread portion.

10. A vehicle tyre as claimed in claim 8 wherein each channel is of tapered form axially thereof and is divergent in the direction of the adjacent sidewall of the tyre.

11. A vehicle tyre as claimed in either of claims 9 or 10 wherein, in each of the axially-outermost ribs, each channel extends at one end to the associated groove and at the other end to the sidewall of the tyre.

12. A vehicle tyre as claimed in claim 11 wherein that end of the channel which extends to the sidewall of the tyre is of a greater cross-sectional area, considered in a plane lying transversely of the channel, than the remainder of the channel.

13. A vehicle tyre as claimed in claim 12 wherein that end of each channel in the sidewall of the tyre is so formed as to deflect fluids ejected through the channel away from the axial direction.

14. A vehicle tyre as claimed in claim 12 wherein one or more deflecting elements are located axially outwardly of those ends of the channels in the sidewall of the tyre to deflect fluids ejected from the channels.

15. A vehicle tyre as claimed in claim 14 wherein said elements are so shaped as to tend to deflect ejected fluids circumferentially of the tyre.

16. A vehicle tyre as claimed in claim 14 wherein said elements are so shaped as to deflect ejected fluids radially of the tyre.

17. A vehicle tyre as claimed in any one of the claims 14 to 16 wherein said elements comprise portions of a shoulder safety rib.

18. A vehicle tyre having a tread portion constructed and arranged substantially as hereinbefore described with reference to and as shown in Figures 1 and 2 of the accompanying drawings.

19. A vehicle tyre having a tread portion constructed and arranged substantially as hereinbefore described with reference to and as shown in Figure 3 of the accompanying drawings.

20. A vehicle tyre having a tread portion constructed and arranged substantially as hereinbefore described with reference to and as shown in Figure 4 of the accompanying drawings.

R. I. G. McKAY,
Agent for the Applicants.

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1150295 COMPLETE SPECIFICATION

1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

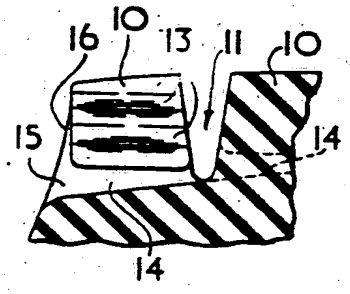

FIG. 1

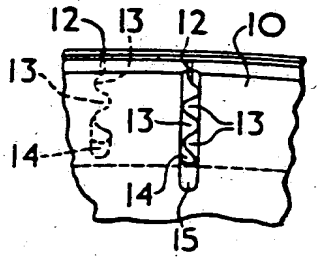

FIG. 2

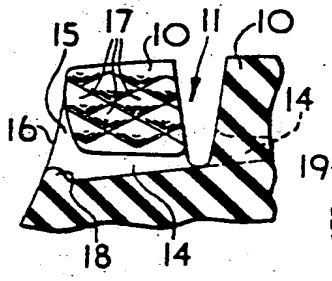

FIG. 3

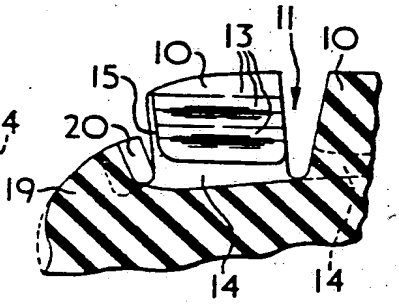

FIG. 4